

4 Harry S Truman Lake

4.1 General Background

Harry S Truman Lake was impounded in October 1979 and reached full pool on 29 November 1979. The primary water quality threats to Truman Lake are sediment, nutrients, bacterial contamination, dissolved oxygen, and herbicides. Currently the lake is listed on the MDNR's 2002 303d list due to elevated concentrations of manganese. As a result a TMDL must be written to deal with the contaminant (MDNR 2002); this is a low priority TMDL for MDNR. Water quality and water quantity issues exist within the upper watershed. Upper watershed issues are beginning to receive some attention as a result of the formation of the Marais des Cygnes, Marmaton, and Little Osage river watershed management plan committee during 2005. There are five Corps lakes (Melvern, Pomona, Hillsdale, Stockton and Pomme de Terre) within the Truman Lake watershed, and when combined, all six lakes comprise 52% of the total surface acres within the district (103,180 A). There are 6 power generation turbines within the Truman Dam, and operation of the turbines historically has been a point of concern in regards to fish mortality (pump-back operation) and water quality standards (i.e., gas supersaturation and dissolved oxygen concentration).

4.1.1 Location

Truman Dam is located on the Osage River 280.2 km (175.1 miles) upstream of the confluence with the Missouri River. The Truman Dam powerhouse is located approximately 2.4 km (1.5 mile) northwest of Warsaw, Missouri. The watershed comprises 15 counties in Missouri and 10 counties in Kansas. Historic water quality sampling sites at Truman Lake include 9 lake, 1 outflow, and 7 inflow sites (Figure 4.1).

4.1.2 Authorized Purposes: flood control, hydroelectric power production, fish and wildlife conservation, and recreation.

4.1.3 Lake and Watershed Data

Pools	Surface Elevation (ft. above m.s.l.)	Current Capacity (1000 AF)	Surface Area (A)	Shoreline (miles)
Flood Control	739.6	4,005.4	209,048	958
Multipurpose	706.0	1,181.6	55,406	
Total		5,187.0		

Total watershed area: 11,500 sq miles (total upstream watershed)
8,914 sq miles (total local drainage below upstream dams;
5,704,960 A)

Watershed ratio: 27.29 FC / 102.97 MP

Average Annual Inflow: 6,913,515 acre-ft

Average Annual outflow: ? acre-ft

Sediment inflow (measured): 22,321 acre-feet (1979 – 1992)

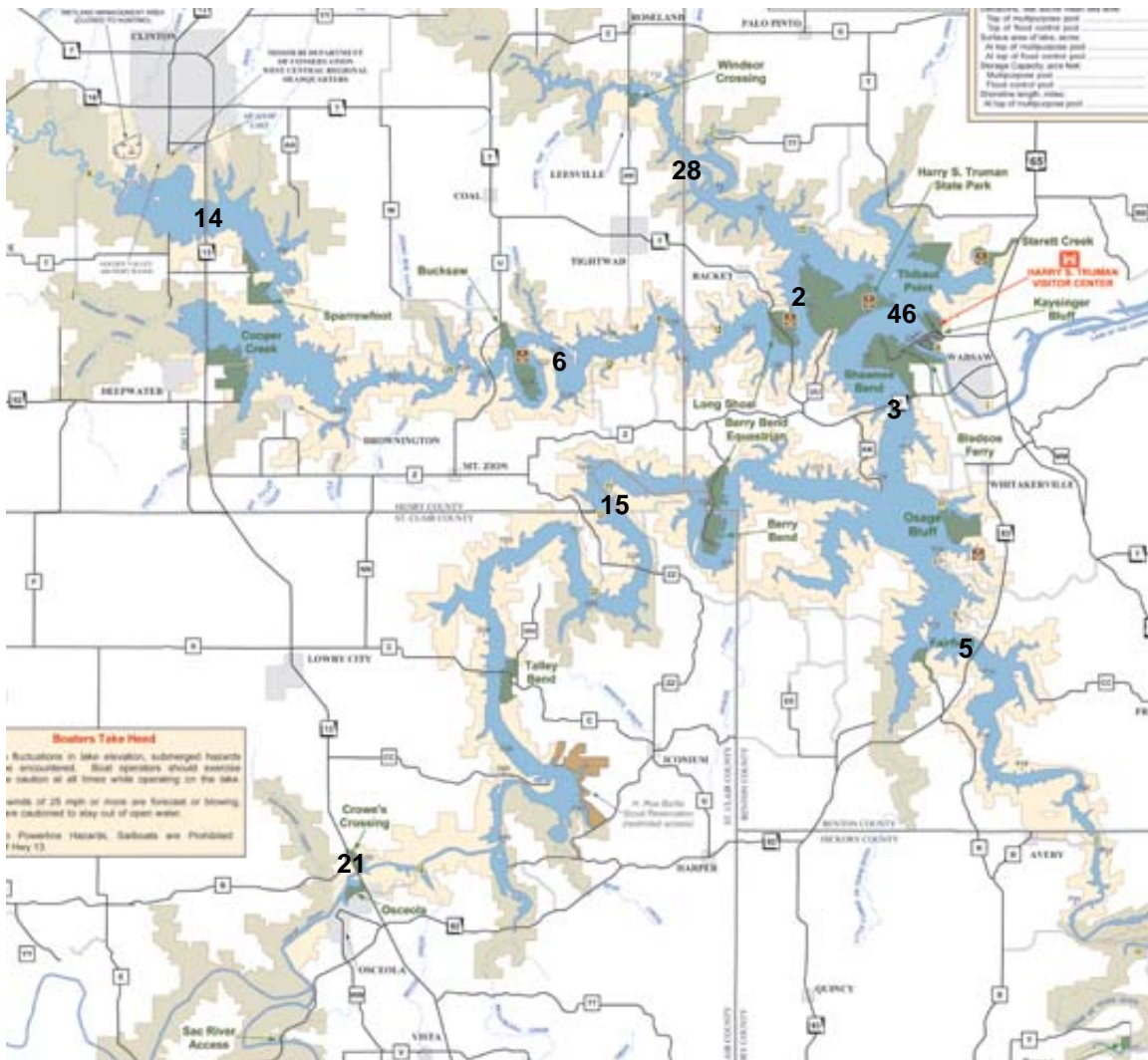


Figure 4.1. Harry S. Truman Lake area map with sample site locations and site numbers.

4.2 2005 Activities

Harry S. Truman lake was categorized as an 'ambient' lake during 2005, thus only surface water quality samples were collected at the nine lake sites (see Figure 4.1). Samples were collected and vertical profiles were recorded monthly from May through September. The Marais des Cygnes, Marmaton, and Little Osage river watershed management plan committee was formed during 2005. The committee is headed by Don Schuster (NRCS) and consists of representatives from MDNR, MDC, EPA, and several counties. This group has also communicated with the Marais Des Cygnes Basin Advisory Committee in Kansas in an effort to coordinate water quality and quantity issues between the two states. The NWK's Water Quality Program has been involved on the periphery to this point, providing input on water quality issues. In addition, the NWK Planning Section submitted a proposal -- *Water Resources Analysis Plan for the Upper Osage River Watershed of Kansas and Missouri* -- during February 2006 via

Northwest Division for consideration of HQ's "Comprehensive Analyses of Multi-Jurisdictional Use and Management of Water Resources on a Watershed or Regional Scale" grant program. Truman Lake staff (OF-HST) providing field assistance with the 2005 WQP included: Rich Abdoler, Larry Smith, Rich Chiles, Erin Cordrey, and Melissa Cook. Bob Marchi, OF-HST Operations Manager, provided insight and background on the lake resources.

4.3 2005 Data

4.3.1 Inflow

No inflow data was collected from Truman Lake during 2005.

4.3.2 Lake

Historic lake data is limited to single sample trips during 1999 and 2002 (August), so the majority of information has been generated this past sampling year. Longitudinal differences in median total nitrogen (TN) concentrations (0.5 – 1.4 mg/L) were observed between sample sites from data collected between 1996 and 2005 (Figure 4.1). Highest median concentrations were measured from samples collected at the Highway 65 bridge sites on both the South Grand and Little Osage river arms, while the lowest median concentration is from the Tebo Creek branch site. It should be noted that all median values exceed EPA's proposed ecoregional nutrient criteria for TN (0.46 mg/L). The TN concentrations measured at Site 14 (South Grand River) are some of the highest values within the district.

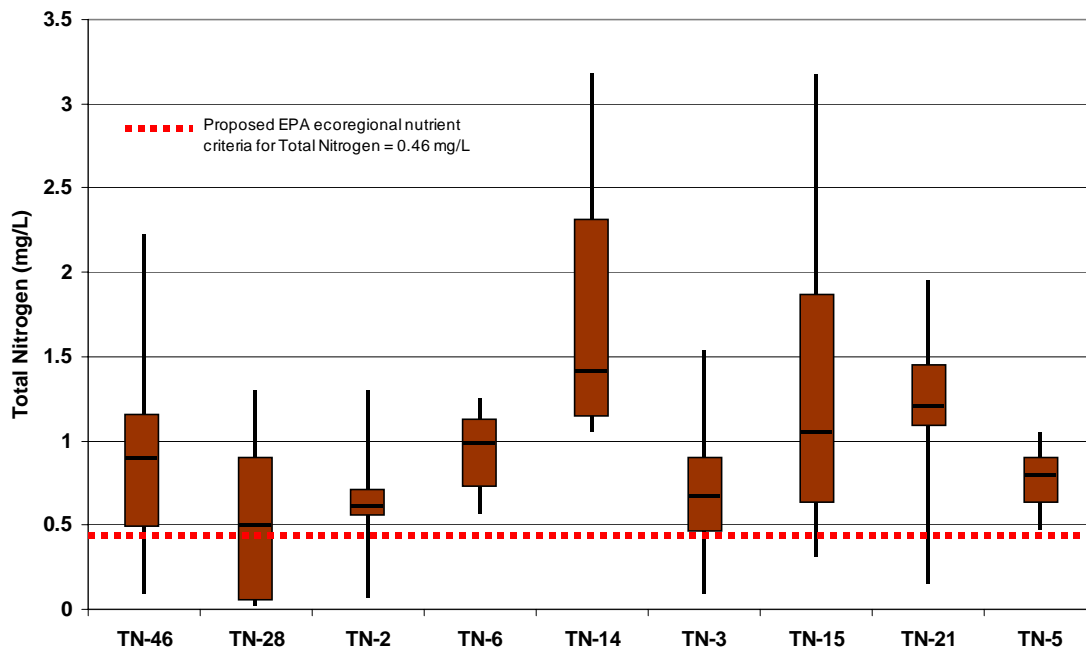


Figure 4.1. Box plots of surface water sample total nitrogen concentrations measured by site during 1999, 2002, and 2005 at Harry S. Truman Lake.

Similar to TN, longitudinal differences in median total phosphorus (TP) concentrations () were detected between sample sites at Truman Lake for data collected from 1996

through 2005 (Figure 4.2). The highest concentrations are associated with up-lake sites, while a consistently elevated TP concentration is measured at Site 14 (South Grand River). It should be noted that very high concentrations have been measured at Site 2 (lower South Grand River site). The primary source of phosphorus for this site is suspected to be failing septic systems. Median TP concentrations for all nine lake sites currently exceed EPA's proposed ecoregional nutrient criteria.

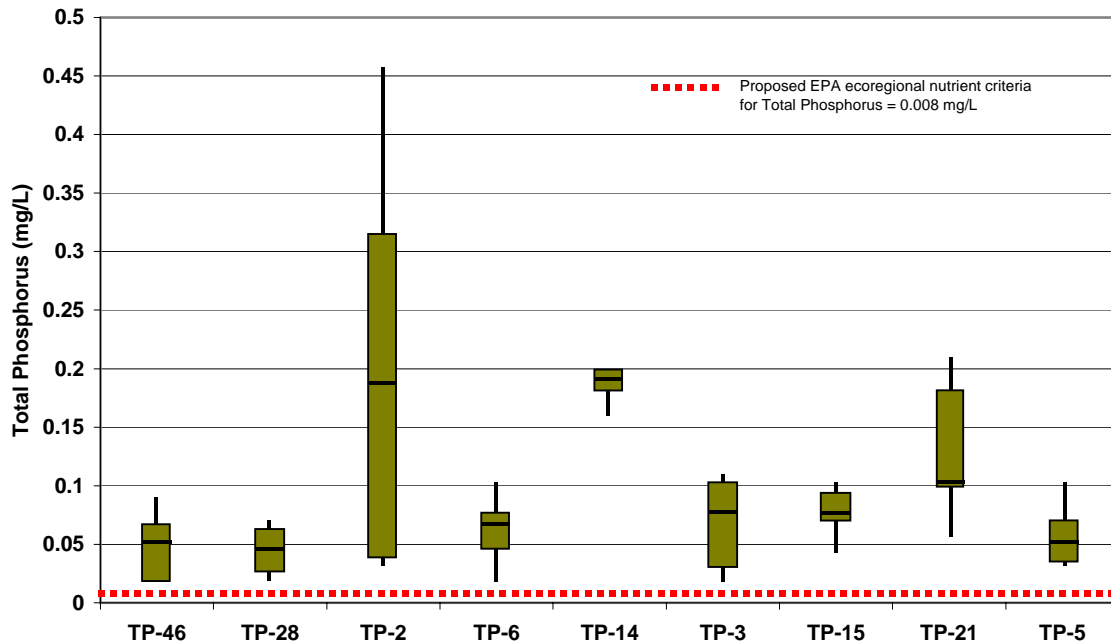


Figure 4.2. Box plots of surface water sample total phosphorus concentrations measured by site during 1999, 2002, and 2005 at Harry S. Truman Lake.

The ratio of TN:TP can be used as a surrogate to determine the dominant algal community within a lake. Ratios $\geq 20:1$ are indicative of desirable algal communities, whereas ratios $\leq 12:1$ are indicative of bloom-forming cyanobacteria (blue green algae). Six of the nine sites exhibited median TN:TP ratios < 12 , indicating certain sites within the lake are at risk for cyanobacteria blooms (Figure 4.3). Sites 2, 14, and 21 exhibited the highest TP concentrations and also the lowest TN:TP ratios. It should be noted the microcystin toxin has been collected from Harry Truman Lake during 2000 (Dr. Jennifer Graham, USGS, personal communication).

Mean chlorophyll a concentrations ranged from 18.9 – 25 ug/L during 2005 (Figure 4.4), which is indicative of nutrient-rich waters. Secchi depth measurements ranged from 0.2 – 1.2 m, indicating the variability of sites and tributaries for the large lake (Figure 4.5). Water clarity was poorest at both upper lake sites (Sites 14 and 21), which would be expected considering the expansive shallow mud flats in these segments of the lake.

Vertical profiles were recorded at the lower lake sites from June through September. Parameters included temperature, dissolved oxygen, pH, conductivity, and turbidity. Based on this information, the lake was strongly stratified both thermally and chemically between a depth of 5 – 8 m during the summer period at Site 2 (Figure 4.6). Summer stratification occurred at a depth of 4 – 7 m at Site 46 (Figure 4.7).

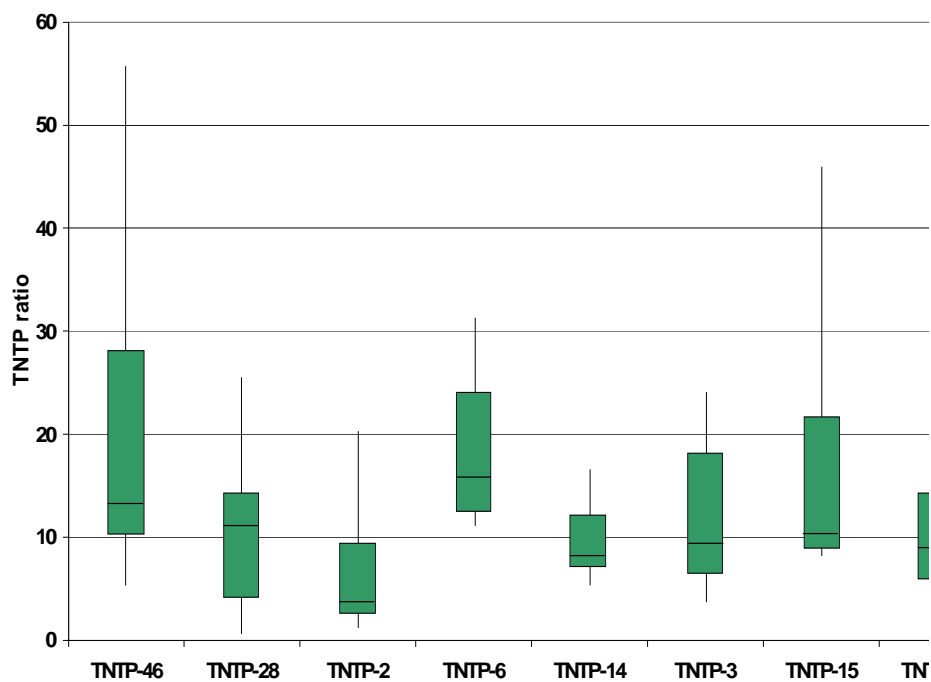


Figure 4.3. Box plots of total nitrogen : total phosphorus ratios from surface water samples measured by site during 1999, 2002, and 2005 at Harry S. Truman Lake.

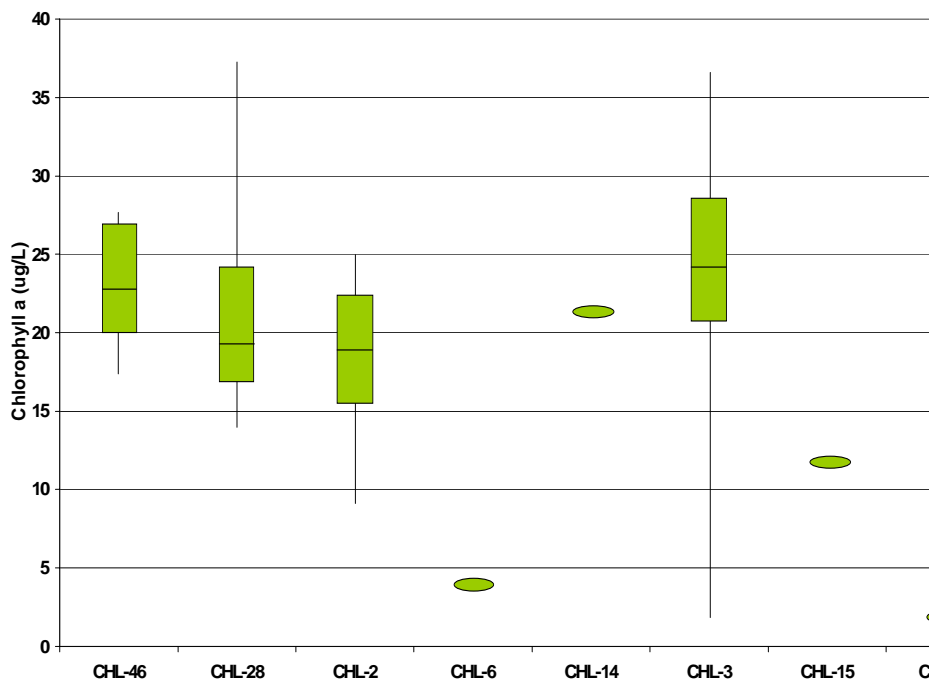


Figure 4.4. Box plots of chlorophyll a concentrations measured by site during 1999 and 2005 at Harry S. Truman Lake.

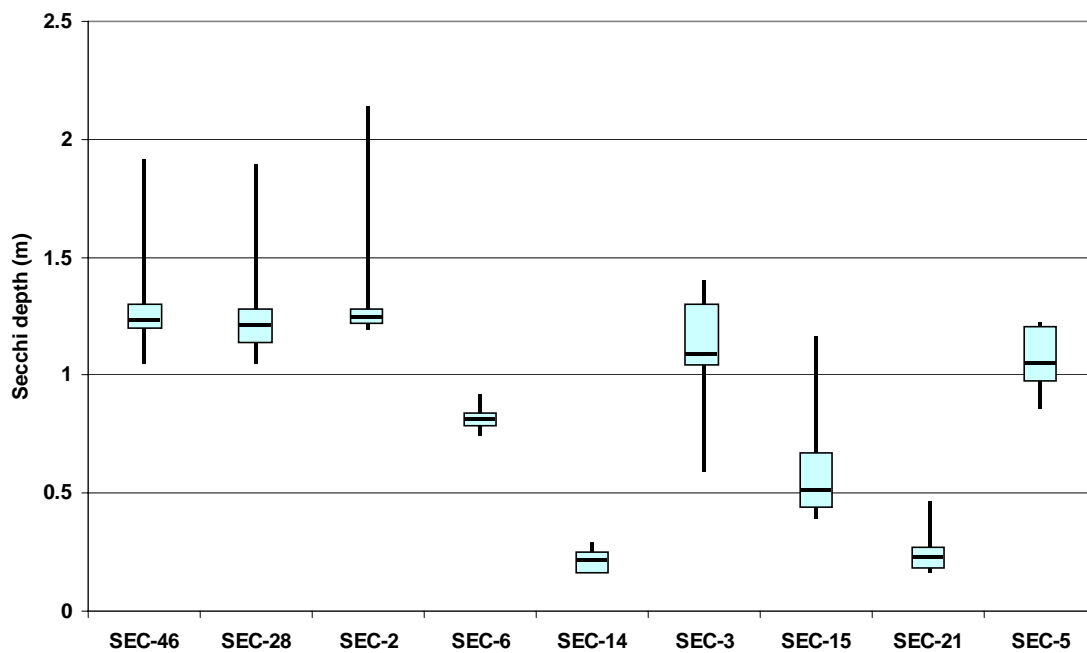
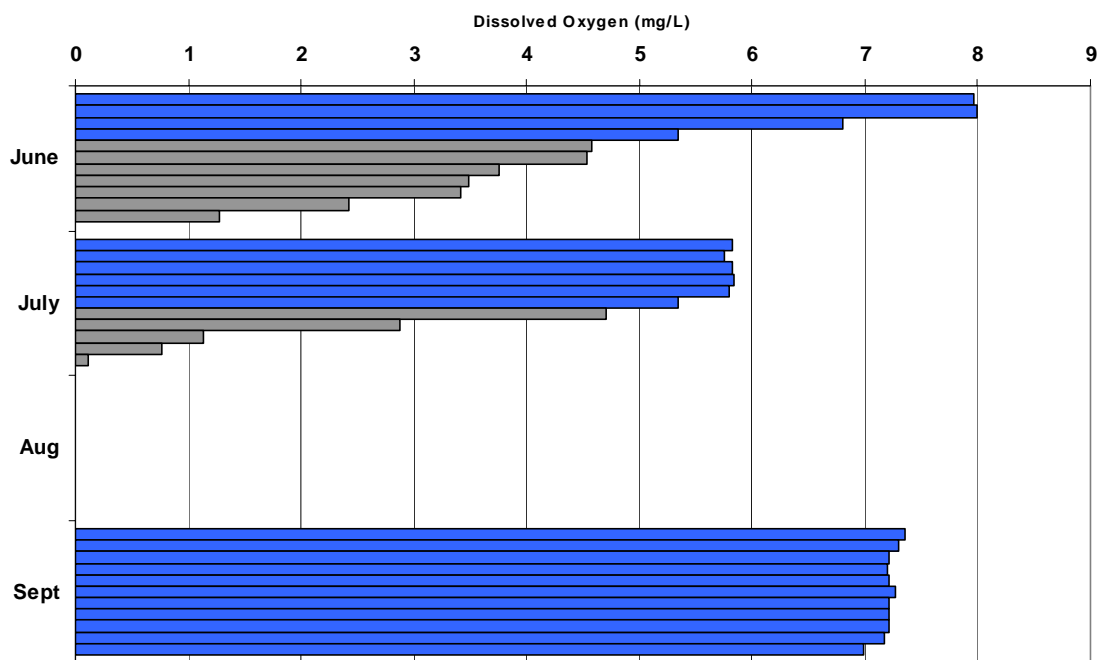


Figure 4.5. Box plots of secchi depth water clarity measured by site during 1999 and 2005 at Harry S. Truman Lake.



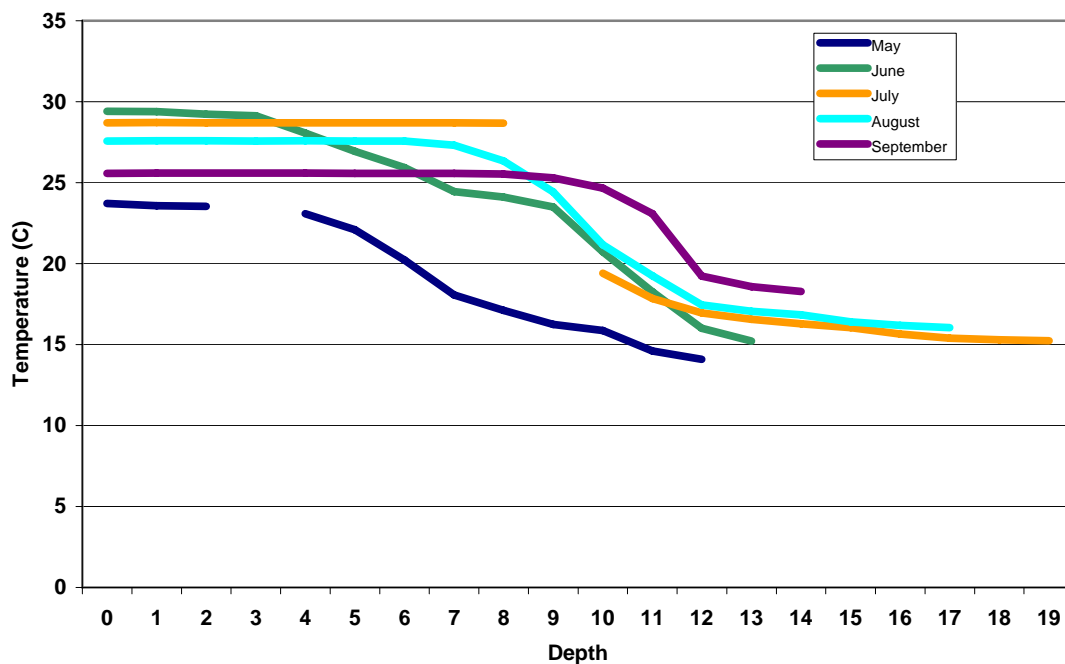
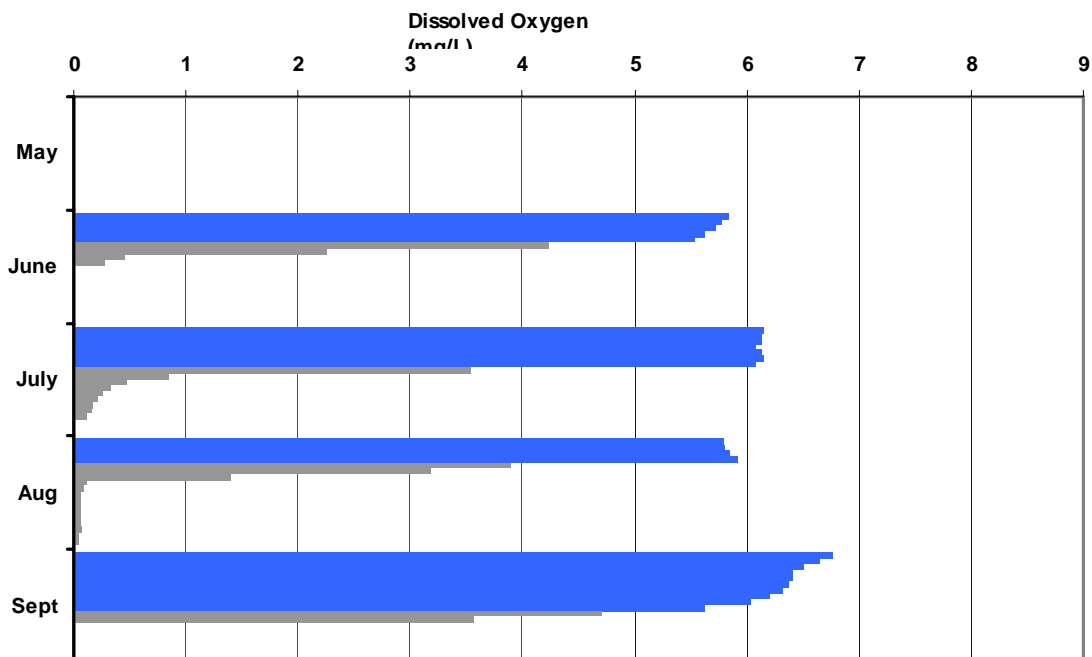


Figure 4.6. Dissolved oxygen concentration (mg/L) histogram and temperature (C) plot from vertical profiles recorded at Site 2 (South Grand arm) from June – September, 2005 at Harry S. Truman Lake.



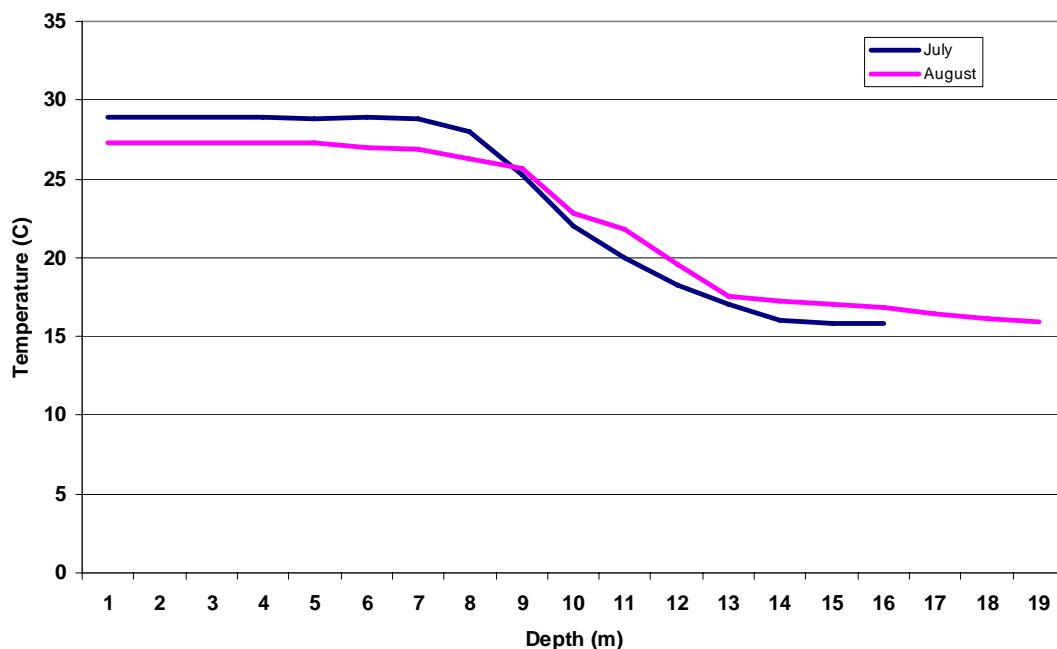


Figure 4.7. Dissolved oxygen concentration (mg/L) histogram and temperature (C) plot from vertical profiles recorded at Site 46 from June – September, 2005 at Harry S. Truman Lake.

Fecal bacteria (*E. coli*) samples were collected from three locations at each of six Corp swimming beaches prior to three major holidays (Memorial Day, July 4th, and Labor Day) during 2005. All samples were well within compliance limits of 126 colonies / 100 ml for a whole-body contact during the recreational season (Figure 4.8). The only elevated sample was collected from Sparrowfoot Beach prior to Labor Day.

4.3.3 Outflow

No outflow data was collected from Truman Lake during 2005.

4.4 Future Activities and Recommendations

Sampling activities for 2006 will include continuation of monthly ‘ambient’ monitoring from May through September, as well as conducting monthly vertical profiles at each of the nine lake sites. An upgrade in DO monitoring equipment will be installed during early 2006 at the Truman Powerhouse. The Marais des Cynges, Marmaton, and Little Osage Rivers watershed plan committee is in the process of developing a watershed management plan above the lake. Interaction with this group would produce a beneficial relationship in regards to lake water quality. It is expected that Truman Lake will be added to a future 303(d) list once the Missouri Clean Water Commission approves nutrient criteria.

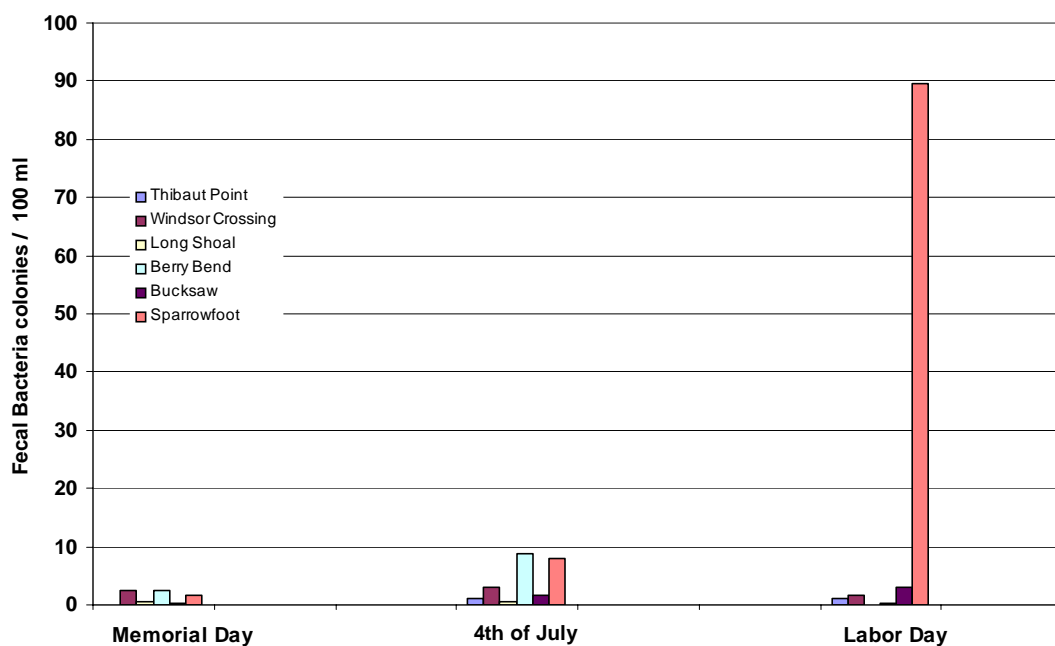


Figure 4.8. Fecal bacteria colonies per 100 ml samples from beach samples collected prior to major holidays at Harry S Truman Lake during 2005.